Evaluation of the Alaska Interagency Aviation Safety Initiative

Prepared for:
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1. Introduction

Aviation crashes are the leading cause of occupational fatalities in Alaska. From 1990 through 1999, aviation crashes in Alaska caused 106 work-related pilot deaths. This rate is nearly five times the rate for U.S. pilots as a whole.[1] In 2000, Congress passed legislation aimed at reducing the number of occupational aviation fatalities in Alaska by 50 percent for the years 2000 through 2009. This legislation created an interagency initiative—the Alaska Aviation Safety Initiative—to improve safety in Alaska through the combined efforts of the Federal Aviation Administration (FAA), the National Transportation and Safety Board (NTSB), the NOAAs National Weather Service (NWS), and the National Institute for Occupational Safety and Health (NIOSH).[2]

The original proposal for the initiative was developed in September 1999, at the invitation of Alaska's Senator Ted Stevens and the recommendation of Jim Hall, Chairman of the National Transportation Safety Board (NTSB). The initiative began as a three-year renewable commitment (FY 2000-2002) with NIOSH acting as the lead agency. Congress appropriated approximately $800,000 per year to fund the initiative. The four agencies have designated senior staff to function as the Alaska leadership team for the initiative. The team meets quarterly to plan, coordinate, and evaluate programs.[3]

The objectives of the Alaska Aviation Safety Initiative (the Initiative) are:

- To reduce the number of aircraft crashes and deaths;
- To promote aviation safety within the air transportation industry in Alaska through epidemiologic risk analysis of aircraft crashes; and
- To evaluate aviation safety interventions.

In order to accomplish these objectives, the four agencies took on five tasks:

1. Gather and analyze injury and fatality data to identify risk factors.
2. Bring together aviation industry working groups to characterize the problems.
3. Develop aviation safety information for pilots, companies, and the flying public.
4. Evaluate effectiveness of and changes to flight safety practices.
5. Evaluate progress and identify additional improvements.

[1] George Conway, Alexandra Hill, Stephanie Martin, Nicolle Mode, Matthew Berman, and others, "Alaska Air Carrier Operator and Pilot Safety Practices and Attitudes." *Aviation, Space, and Environmental Medicine*, Vol. 75, No. 1, January 2005.
[2] Public Law No: 106-69—Making appropriations for the Department of Transportation and related agencies for the fiscal year ending September 30,2000, and for other purposes.
[3] Final Draft: Status Report to Congress on NIOSH Participation in Alaska Interagency Aviation Safety Initiative, Anchorage, Alaska, March 12, 2002.

To accomplish the first task, the agencies collected and merged aviation accident and operations data from NTSB, FAA, the U. S. Department of Transportation (DOT), and NIOSH. Analysis of these data led to the publication of two scientific studies.[4] A central finding of the studies was that flying into poor visibility conditions without adequate information, equipment, or expertise was a main cause of aviation fatalities in Alaska.

In addition to data gathering and analysis, NIOSH team members conducted focus group meetings with pilots, operators, and villagers in five Alaska regions to help the agencies characterize problems in Alaska. They also conducted operator and pilot surveys.[5] The focus groups and surveys came up with several recommendations. These included improving weather reporting and infrastructure, additional pilot training, limiting duty hours to reduce fatigue, and reducing pressures to fly into deteriorating weather conditions. The focus group recommendations influenced the development of programs—among them Capstone, the Medallion Foundation, Mike-in-Hand, and Circle of Safety—that try to address the concerns of agencies, industry, and the flying public.

The final Initiative tasks require the agencies to evaluate the programs created to promote aviation safety in Alaska. To that end, NIOSH contracted with the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage (UAA). The following report looks at programs, infrastructure changes, accidents and accident rates between 1997 and 2004. It addresses the following questions:

- Has flying become safer in Alaska?
- Which types of flying (e.g., general aviation, commuter vs. air taxi flights) are the most risky, and which have shown changes in safety?
- Where in Alaska is it most risky to fly? Has this changed?
- To what extent can the data show that specific programs are associated with improved safety?

Throughout the report we adopt the FAAs terminology when we describe different types of aircraft and flying. Rules governing U.S. aircraft operations are part of the Code of Federal Regulations (CFR). The CFR is divided into 50 titles corresponding to areas subject to federal regulation. Rules pertaining to Aeronautics and Space are contained in Title 14, which is also referred to as the Federal Aviation Regulations (FAR). Each title is divided into chapters and each chapter into parts. A federal agency is

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[4] Controlled Flight into Terrain Accident among Commuter and Air Taxi Operators in Alaska, T. Thomas, D. Bensyl, J. Manwaring, and G. Conway, *Aviation, Space and Environmental Medicine*, Vol 71, No. 11, November 2000. Factors Associated with Pilot Fatalities in Work-related Aircraft Crashes in Alaska, 1990-1999, D. Bensyl, K. Moran, G. Conway, *American Journal of Epidemiology*, Vol. 154, No. 11, December 2001.

[5] "Alaska Air Carrier Operator and Pilot Safety Practices and Attitudes." By George Conway, Alexandra Hill, Stephanie Martin, Nicolle Mode, Matthew Berman, and others. Published in *Aviation, Space, and Environmental Medicine*, Vol. 75, No. 1, January 2005.

"Flight Safety in Alaska: Comparing Attitudes and Practices of High- and Low-Risk Air Carriers." By G. Conway and N. Mode, National Institute of Occupational Safety and Health; and Matthew Berman, Stephanie Martin, and Alexandra Hill, Institute of Social and Economic Research. Published in *Aviation, Space, and Environmental Medicine*, Vol. 76, No. 1, January 2005.

assigned responsibility for each part. The FAA is the regulatory agency for CFR Title 14, chapter 1, Parts 1-199. In this report we discuss operations under part 91, 121, and 135. Even through our primary focus in this study is FAR part 135 operations, we present accident data for FAR parts listed below in Table 1to provide context for our findings. Part 91 contains the general rules for aircraft operation. It is also referred to as "general aviation". Part 91 regulations are the least restrictive. Part 91 can apply to any size aircraft because it governs the type of operation and not the size of the aircraft. Parts 121 though 135 contain regulations for operators carrying passengers or cargo for revenue. We refer to these operators as "air carriers". Air carrier regulations are in addition to part 91. FAR part 121 covers commercial carriers with 10 or more seats[6], and is divided into scheduled and non-scheduled service. FAR part 135 carriers have fewer than 10 seats. We adopt the FAA's terminology and refer to part 135 carriers providing scheduled service as "commuters" and carriers providing non-scheduled service as "air taxis". FAR part 125 covers operations of large aircraft.

Table 1 FAR Part Descriptions

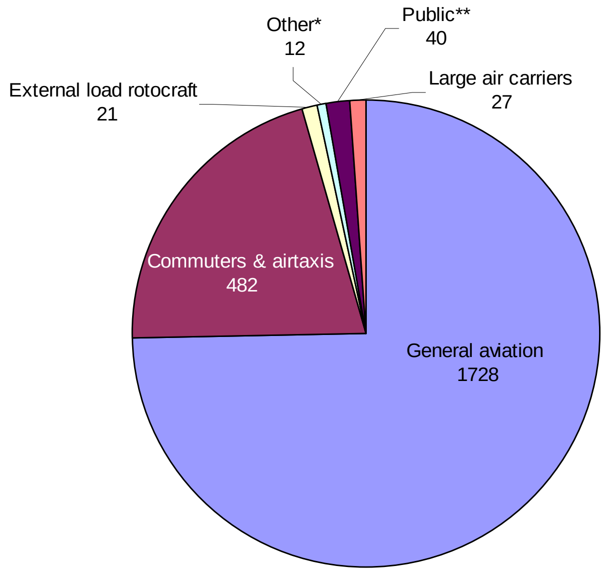
Part	Description	Application
091	General aviation	
121	Large commerical air carrier	
125	20+ PAX,6000+ LBS	Fuel transport
127	Scheduled helicopter	
129	Foreign commercial carrier	
133	Rotorcraft-external load	Logging operations
135	Commuter and air taxis	
137	Agricultural	Crop dusting
PUBU	Public use	Government agencies

Source: NTSB (2005) Accident and Incident Database Data Dictionary NTSB2_AIRCRAFT_LIST flight rules (www.nasdac.faa.gov accessed 7/15/05)

As Figure 1 shows, most aviation accidents in Alaska involve general aviation. Very few accidents involve large commercial carrier (FAR part 121) operations. This analysis focuses on commuter and air taxi operations which accounted for about 21 percent of aviation accidents from 1990 through 2004.

[6] In 1997 the definition of parts 121 and 135 changed. Prior to 1997, part 121 operators were those with 30 or more seats. Part 135 carriers had fewer than 30 seats.

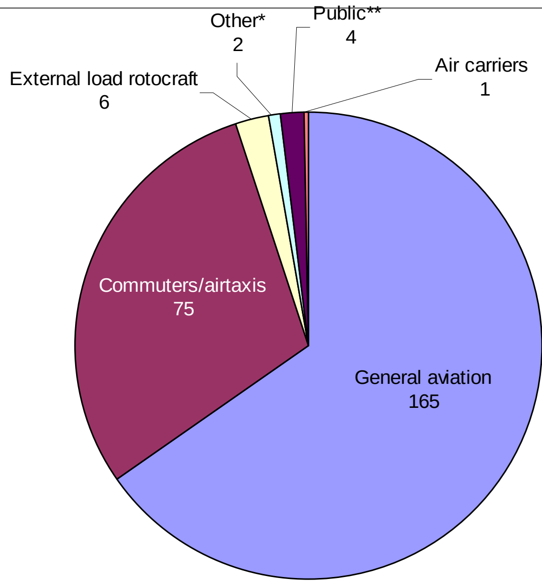
Figure 1Aviation Accidents 1990-2004 by FAR Part Number



Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version).
*Other includes foreign carriers (part 129), agricultural application ((part 137) & aircraft w/payload capacity of 6,000 lbs (part 125).
** Public includes FAR coded as 'Unknown' in NTSB database where owner or operator was a state or federal agency.

Comparing Figure 1 and Figure 2 shows that commuter and air taxi operations make up a larger share of fatal accidents (about 30 percent) than of accidents. Fatal accidents involving large air carriers are rare.

Figure 2 Fatal Accidents in Alaska by FAR Part, 1990-2004



Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version).
*Other includes foreign carriers (part 129), agricultural application (part 137) & aircraft w/payload capacity of 6,000 lbs (part 125).
** Public includes FAR coded as 'Unknown' in NTSB database where owner or operator was a state or federal agency.

In the remainder of the report, we first describe the evolution of the programs of the Alaska Interagency Aviation Safety Initiative. Next, we document other recent developments in the Alaska aviation industry that were not part of the interagency initiative but might affect safety, including changes in safety-related infrastructure. After providing this context, we analyze trends and variation in accidents, incidents, and documented occurrences over the period 1990-2004. Then, we discuss changes in aviation operations levels over the period 1997-2004, and analyze accident rates based on the operations estimates. We conclude with an assessment of the evidence for the effects of the interagency initiative on safety, qualified by the study's limitations.

2. Recent Alaska Aviation Safety Efforts

This section describes aviation safety programs and infrastructure improvements currently in place in Alaska. For each of the major new aviation safety programs, we document when it began and how it grew, who participated, who should benefit and how.

Capstone

The FAA Alaska Region's Capstone program was implemented in southwest Alaska between 1999 and 2003. It has since been expanded into southeast Alaska. However, implementation there has largely occurred too recently to show measurable effects on safety. Consequently, this report focuses on the effects of Capstone implementation in Southwest Alaska. The Capstone program is a joint industry-government initiative to improve aviation safety and efficiency in Alaska, based on innovative tools and technology. Capstone's first phase began in 1999 in southwest Alaska, primarily in the Yukon-Kuskokwim Delta (Y-K Delta). The program involves:

- Equipping commuter airlines, air taxis and selected part 91 operators with avionics that shows pilots their location and information about nearby terrain, other aircraft, and weather;
- Building ground stations that broadcast weather and flight information and that can provide radar-like surveillance of planes equipped with the new avionics;
- Installing weather observation stations and creating and publishing instrument approaches, in order to provide more weather information and enable pilots to land at isolated airports in poor weather;
- Training pilots of participating companies how to use the new tools effectively.

Capstone primarily targets commercial aviation operating under FAR part 135. However, private aircraft owners may install Capstone equipment in their planes, and all pilots can take advantage of the infrastructure improvements.

Between 2000 and 2003, the FAA equipped over 200 aircraft, targeting part 135 operators in the Yukon-Kuskokwim (Y-K) Delta. Table 2 shows the current status of those aircraft. Most belong to commercial operators who provide most of the commercial flights in the Y-K Delta. If those operators station all their 151 capstone-equipped aircraft in the delta, they make up about 95 percent of the estimated total fleet of commercial aircraft operating there. We know that operators sometimes move Capstone-equipped aircraft to other regions of the state, replacing them in Y-K Delta with aircraft that may not have Capstone avionics. Nevertheless, the great majority of aircraft flying commercially in the Y-K Delta are now equipped with Capstone avionics.

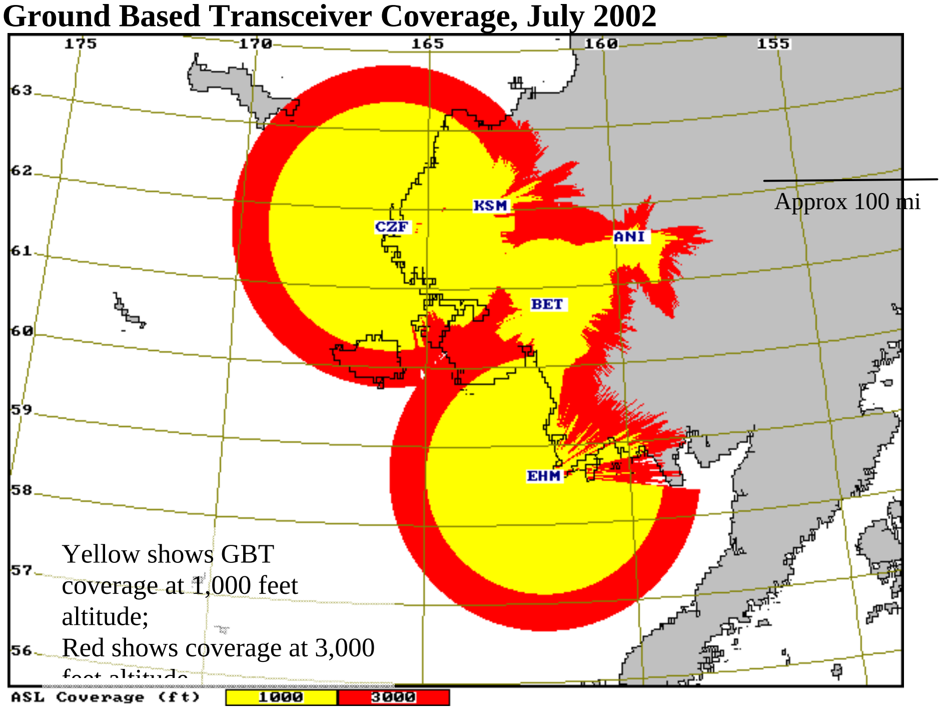
Table 2 Current Status (July, 2005) of Capstone Equipped Aircraft

Aircraft Status	Number of aircraft
Commercial operators serving the Y-K Delta	151
Other commercial operators	11
Aircraft inactive or equipment removed	15
Flown in non-commercial aviation	21
Aircraft ownership changed after installation	11
Total Aircraft	209

Source: www.alaska.faa.gov/capstone/

Avionics-equipped aircraft can use the GPS-driven navigation and terrain awareness capabilities, and the transceiver part of the equipment will allow pilots to see other Capstone-equipped aircraft near them. For the pilot to be able to use Capstone's real-time weather and flight information capabilities, and to help companies track their aircraft remotely, those aircraft must be within range of a properly equipped ground station. A Bethel ground station was commissioned in 2000, and two additional stations at St Marys and Aniak in 2002. Those three stations covered most of the coastal areas of the Y-K delta (see Figure 3, below). Additional ground stations were installed in Cape Newenham, Cape Romanzof, Dillingham, King Salmon, Site Summit (outside Anchorage), Sparrevohn, Tatalina, and Unalakleet. Those stations were not fully operational during our study period. In general, pilots could receive text weather information and some NEXRAD (Next generation Radar) weather maps.

Figure 3 Ground Based Transceiver Coverage, July 2002



Source: FAA Capstone Office

Two other Capstone-program improvements–automated weather stations and new GPS-based approaches for remote airports–benefited all pilots, not just those with Capstone equipment. From December 1999 through December 2001, the FAA published GPS approaches and installed AWOS III automated weather stations in 10 airports in southwest Alaska (Table 3).

Table 3 Capstone Phase I GPS Approaches and Weather Station Installations

Airport	GPS Approach	Weather Station
Egegik	Dec 2001	Pre-1999
Mountain Village	Dec 1999	Jun 2000
Holy Cross	Oct 2000	Mar 2001
Kalskag	Feb 2000	Mar 2001
Platinum	Dec 1999	Mar 2001
Russian Mission	Apr 2000	Mar 2001
St. Michael	Dec 1999	Mar 2001
Kipnuk	Oct 2000	Apr 2001
Koliganek	Feb 2000	Apr 2001
Scammon Bay	Oct 2000	2001
Pilot Point	Feb 2004	Sep 2002

Source: www.alaska.faa.gov/capstone/

Capstone technology–especially the avionics– is most likely to help prevent mid-air collisions and controlled-flight-into-terrain (CFIT) accidents, which make up only a small part of the small-plane accidents in southwest Alaska but are the most likely to cause deaths. The technology is designed to make it easier for pilots to fly, by making it easier to navigate, by providing more current weather information, and by making instrument landings possible when weather deteriorates.

Medallion Foundation

About eight years ago, the Alaska Air Carriers Association (AACA) decided to create a non-profit organization–the Medallion Foundation–with a goal of fostering a new safety culture in the industry in Alaska and reducing aviation accidents. They asked Senator Ted Stevens to help them find funding for their idea. The Medallion Foundation received its first funding through the FAA in FY2002, and held its first seminar in August of that year. FAA funding has continued at approximately $3 million per year.[7]

The foundation's first program was the Medallion Five Star Shield Program. It is a voluntary program for air carriers that awards stars for achievements in five critical areas of airline safety—simulator training, operational control, safety programs, internal audit programs, and maintenance and ground service. Once an airline has earned a star in each of the five areas, it is eligible to receive a Medallion Shield. Star carriers are eligible for reduced insurance rates. More than 60 air carriers are enrolled in the program, and there are currently two Medallion Shield companies—Alaska Airlines and PenAir. Eighteen companies have completed the requirements to earn at least one star.

[7] Conversation with Jerry Dennis, Executive Director, Medallion Foundation, March, 2005.

In March 2004, the foundation added a second program geared to general aviation pilots—the Medallion Flyer Program. In the past year, over 700 pilots have enrolled in the program. The program focuses on getting pilots to use personal safety and risk management programs, as well as flight training devices (FTDs). The foundation currently has 11 FTDs located in Anchorage, Fairbanks, Nome, Talkeetna, King Salmon, Juneau, Ketchikan, and Bethel. The foundation also has supporting members—companies and businesses such as school districts, hospitals, government agencies, and contractors—that agree to direct their business to Medallion carriers.[8]

Mike-in-Hand

In the spring of 2000, Congress passed legislation directing the National Weather Service, in consultation with the National Transportation Safety Board and the Governor of the State of Alaska, to continue efforts to develop a "mike-in-hand" weather observation program.[9] The purpose of the program was to provide pilots in rural areas with improved weather information. The National Weather Service worked with the FAA to install ground-to-air radios at 12 Weather Service offices. These radios allow pilots to call the weather service office directly and speak to a meteorologist, even if the local flight service station is closed. Meteorologists can provide the pilot with useful real-time information that may be unavailable from automated weather stations, such as how weather conditions have been changing, and runway braking conditions.

The first "Mike-in-Hand" broadcast took place from the NWS's McGrath Weather Service Office on May 3, 2001.[10] Eleven other staffed weather offices located at airports in Alaska had radios installed during the summer of 2001—Annette island, Barrow, Bethel, Cold Bay, Homer[11], King Salmon, Kodiak, Kotzebue, Nome, St. Paul Island, and Yakutat.[12] The Mike-in Hand program was designed to provide weather information to pilots via VHF radio when the local FAA facility personnel are unavailable. Since a pilot's first call for weather observations is to the FAA flight service station, use of the mike-in-hand program varies from location to location depending on the hours of the FAA flight service station.

Circle of Safety

In October 2002, the FAA introduced a consumer education program called the Circle of Safety Program to educate the flying public about their rights and responsibilities with regard to safety. The NTSB study had identified acceptance of risk as one of the main factors contributing to aviation accidents in Alaska. The FAA hopes that this new program will enable passengers and organizations to accept less risk when making choices about flying.

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[8] www.medallionfoundation.org
[9] Public Law 106, Sec.156(b)—Wendell H. Ford Aviation Investment and Reform Act for the 21st Century.
[10] www.legislative.noaa.gov/Archives/1999/informeroct0799.htm ; conversation with Chris Strager, Deputy Regional Director, National Weather Service, February 2005.
[11] Homer's Mike-in-Hand program is the only location that is no longer operational. Interview with Jim Jones, Chief of Data Acquisition Branch, NWS Alaska Region Headquarters, August 30, 2005.
[12] www.alaska.faa.gov/aat/notices/WX.htm

The FAA uses a circle to illustrate the idea that responsibility for safety is shared by the many entities in aviation—the FAA, pilots, air carriers, and consumers. Each entity has different responsibilities. Government sets basic standards. Individual pilots and air carriers have a responsibility to meet those standards and provide quality service to customers. Organizations that contract for aviation services have a responsibility to see that the safest mode of transportation is the standard for their employees. Customers have the right to a safe journey and are also responsible for following the rules. All of these groups make up the circle of safety.

The Circle of Safety Program focuses on the safety education of the consumer of aviation because the FAA believes that no other safety initiative addresses the consumer piece of the circle. The program defines consumers as individuals, agencies or organizations that contract for aviation services. It encourages consumers through educational materials and advertising in magazines, travel publications, and on television to ask pilots questions about safety before they fly. It encourages organizations to have a corporate safety officer who can negotiate with air carriers for such things as insurance levels and types of aircraft. For example, one Alaska school district stipulates the use of twin-engine aircraft for transporting students. The program works in collaboration with other aviation safety groups such as the Medallion Foundation.[13]

[13] Communication with Kieran O'Farrell, Regional Safety Program Manager, FAA Alaska Region, February 11, 2005; www.alaska.faa.gov/flt_std/Community/Logo.cfm

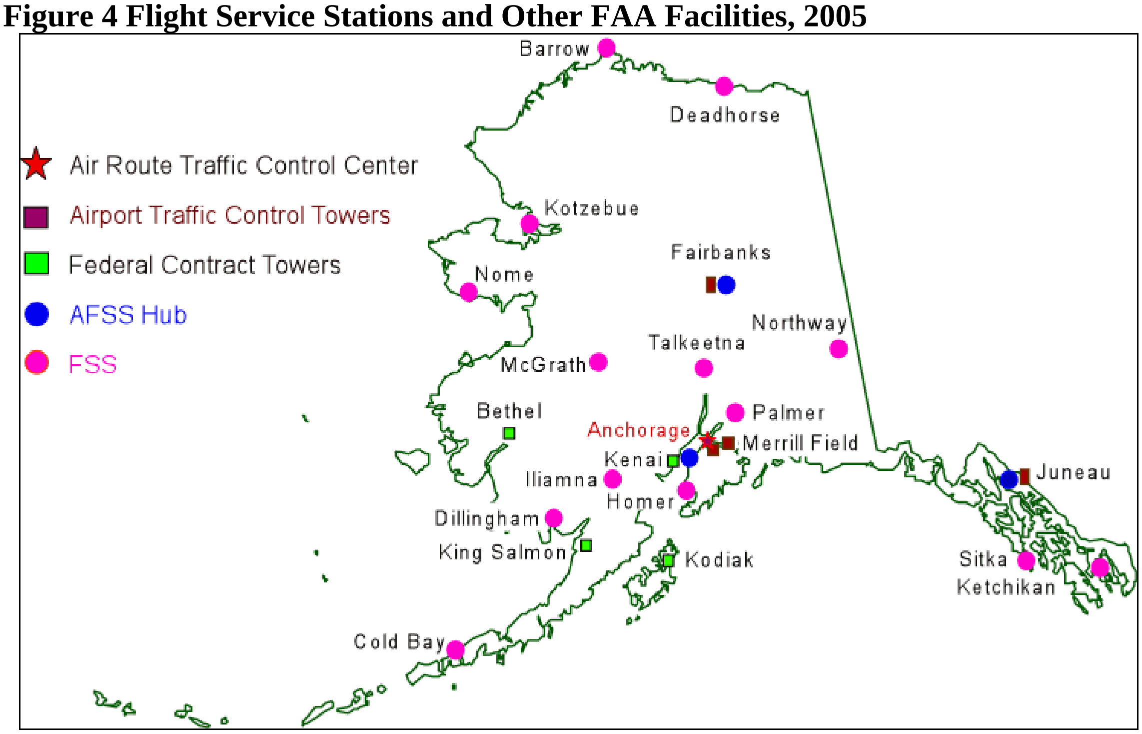
3. The Changing Alaska Aviation Industry

This section summarizes the recent history of changes in aviation safety infrastructure in Alaska, in addition to those related to the Capstone program described previously. Although the changes are not directly part of the interagency initiative, they are important for understanding changes in aviation safety. The types of changes include Flight Service Station (FSS) changes, new instrument approaches, and weather cameras, as well as other issues that affect pilots, such as bypass mail rules.

Flight Service Stations

Historically, there were 28 FAA Flight Service Stations (FSSs) in Alaska. In the 1980s, a national program was established to consolidate all the FSSs into larger automated facilities. The program was implemented in the lower 48 and in Hawaii, reducing 300 FSSs to 58 automated facilities. In Alaska, the 28 FSSs were scheduled to be consolidated into 3 automated FSSs (AFSSs). Alaska built three AFSSs in Fairbanks, Kenai, and Juneau, and closed 14 FSSs between 1990 and 1994. However, aviation user groups did not feel that the automated facilities provided the same level of service as the smaller satellite FSSs did. These user groups successfully lobbied for a moratorium on closures and, in 1994, the Alaska congressional delegation and the FAA agreed to a moratorium.[14] Alaska currently has 14 flight service stations (pink on Figure 4) as well as three Automated FSSs (blue on Figure 4).

Figure 4 Flight Service Stations and Other FAA Facilities, 2005

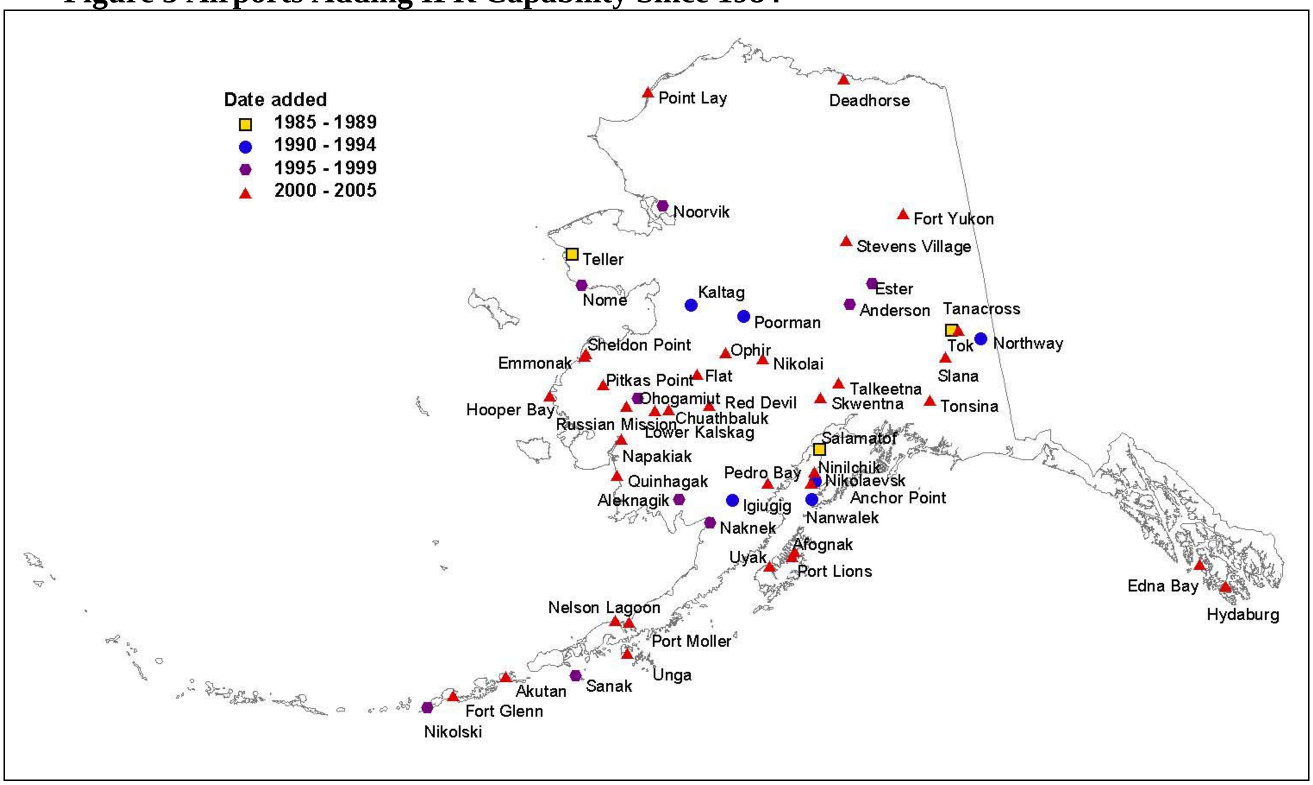


Source: FAA, http://www.alaska.faa.gov/at/

[14] Conversation with Mike Tarr, Acting Service Area Director, Flight Service in Alaska, FAA, 2/18/05

Since the 1980s, the FAA has invested more than $1 billion in building runways and taxiways and installing lights and navigation aids throughout the state of Alaska. The National Weather Service and the FAA have installed over 100 automated weather observation systems to supplement human weather observers. Improved navigation and weather information have greatly increased the number of airports that are IFR-capable, that is, they have both infrastructure and published procedures that allow pilots to use their aircraft avionics to take off and land safely in poor weather. Figure 5 below shows the airports that have gained IFR capability in the last 20 years. Some of these airports are also listed in Table 3, because their infrastructure improvements were funded through the Capstone program. In addition, the FAA established its own satellite communications system to provide reliable communications among facilities.

Figure 5 Airports Adding IFR Capability Since 1984

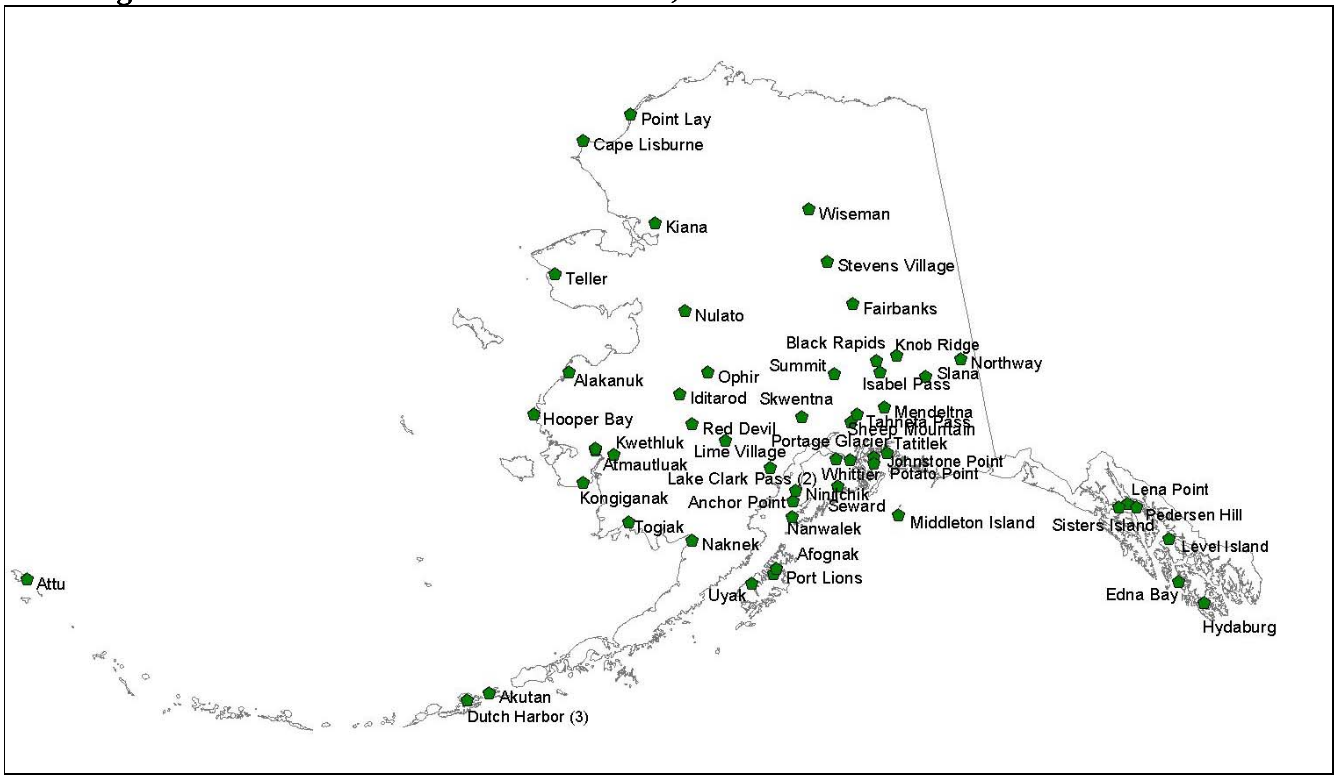


Source: Best available estimates from the FAA, Alaska Region

Since 1997, the FAA's Alaska Region has been developing a network of video cameras at remote airports and in mountain passes. However, growth was slow until the program received $5 million from Congress in 2004. Currently, there are weather video cameras at 54 remote airports and mountain passes across the state, providing real-time images of weather conditions accessible on the internet (Figure 6). Another twelve weather camera installations are in progress with a total of 138 proposed sites across the state in the next few years. [15]

[15] Conversation with Sue Gardner, Weather Camera Program Manager, FAA, February 16, 2005.

Figure 6 FAA Weather Cameras in Alaska, 2005



Source: http://akweathercams.faa.gov/nofrillsframe.html

Bypass Mail

Bypass mail is a federal subsidy for heavy shipments that would otherwise have to be shipped as air cargo at higher rates. Businesses deliver shipments bound for rural Alaska directly to qualified air carriers, ‘by-passing’ the post office. Shippers pay the post office postal rates for the shipment, but the post office pays the air carriers their actual costs to deliver the cargo. The subsidy is intended not only to give Alaska’s rural communities a less expensive way to receive shipments of goods, but also to subsidize the operation of small carriers who provide passenger service to those communities. However, the way that the system was implemented ensured that mail was much more profitable to carry than passengers. Consequently, many carriers entered the market to provide bypass mail as their primary line of business.

To address the perceived inefficiencies of this system, Congress revised the laws governing bypass mail in 2002. The revisions guarantee 70 percent of bypass mail in rural markets to carriers providing passenger service, and 20 percent to carriers providing non-mail freight service. The remaining 10 percent is initially allocated to currently qualified carriers who won’t qualify under the new rules. That group will be phased out over three years and the passenger carrier and freight carrier shares will increase to 75 and 25 percent, respectively. In addition, companies carrying the mail from Anchorage or Fairbanks to rural hubs (such as Bethel or Kotzebue) would also have to provide passenger service, except for a few cargo carriers who are grandfathered in. These changes tend to favor larger companies with greater passenger and freight capacities over very small carriers with small aircraft. The intent is that carriers completely dependent on mail for their financial survival would no longer operate. The subsidy would be more targeted at passenger carriers, and to the extent that those carriers are more cost effective than small, mail-only carriers, the total amount of subsidy would be reduced for the same service to rural residents.

4. Changes in Accidents, Incidents, and Occurrences

This section describes aviation accidents in Alaska. The NTSB defines "accident" as "an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage".[16] Besides airplanes and helicopters, the Alaska accident dataset includes one glider, two gyroplanes and one ultra-light. Accidents are counts of aircraft involved in collisions, rather than the events. For example, a midair collision counts as two accidents, not one because two aircraft are involved.

Because the safety initiative is primarily directed at air taxi and commuter operations, we focus most of our data collection and analysis effects there. However, we include data on other types of aircraft and flying to provide context for our analysis. In this section, we group accidents in several ways to look at trends and patterns. We begin by describing statewide trends in accidents, grouping them by Federal Aviation Regulation (FAR) part. When we narrow the description to accidents involving commuters and air taxis, we group them by region and type of flight plan. Besides FAR commuter and air taxi accidents, we include accident data for FAR part 135 operations flying as part 91. These are commuters or air taxi operators flying without passengers or cargo, usually positioning aircraft. Accident data come from the National Transportation Safety Board (NTSB) accident and incident database[17]. Data show several patterns:

- From 1990 to 2004 accidents statewide have been decreasing.
- Accidents involving commuters and air taxis were at their lowest level in 2003 and 2004.
- Air taxi and FAR part 135 flying as 91 accidents outnumber commuter accidents.
- There have been no fatal accidents involving commuters since 2002. Fatal accidents involving air taxis have not decreased.
- Since 1990, the largest number of accident involving commuters and air taxis were in south central and southwest Alaska. But accidents in these regions have decreased the most in the past two years.
- Accidents are rare on flights where IFR flight plans have been filed.

[16] "Aviation Accident Synopses World Wide Web Page" http://www.ntsb.gov/Info/gils/gilssyn.htm, accessed 9/02/05.

[17] The database contains information collected by NTSB during accident or incident investigations. (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version)

Accidents

Figure 7 shows the number of aircraft accidents in Alaska from January 1, 1990 through December 31, 2004. Total accidents decreased by about 4 percent per year, dropping from 194 in 1990 to about half as many in 2004 (102 accidents). Looking at the period from 2001 to 2004, roughly corresponding to the period in which safety program were being implemented, accidents rose in 2002, but dropped by eight percent annually over the four years.

Figure 7 Aircraft Accidents in Alaska, 1990-2004

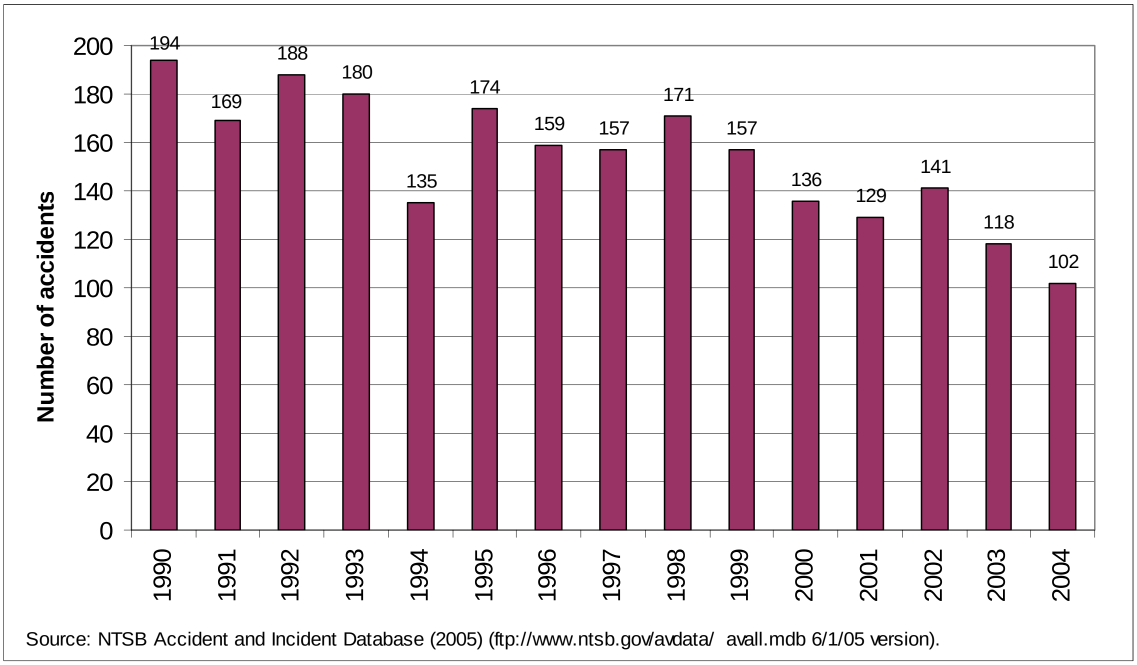
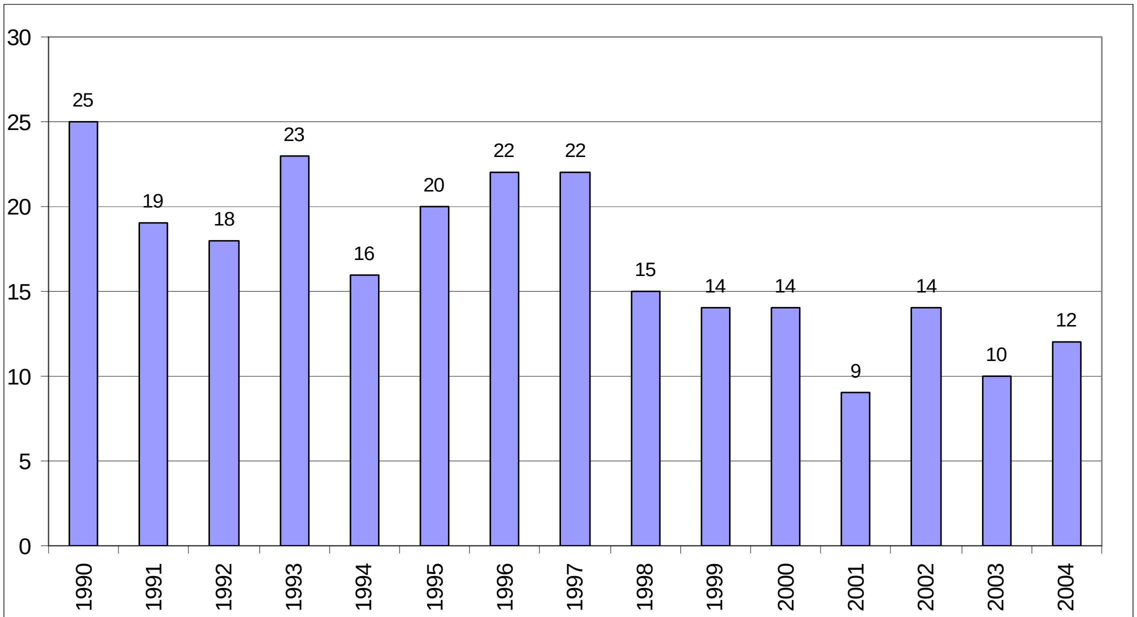


Figure 8 shows that overall, from 1990 to 2004, fatal accidents decreased by more than half, dropping by about 6 percent per year, slightly faster than the total number of accidents. Fatal accidents during period from 2001 to 2004 are fewer than in the period prior to 2001.

Figure 8 Fatal Accidents in Alaska, 1990-2004



Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/ avall.mdb 6/1/05 version).

Accident data in Table 4 show that FAR part 91 operations make up the largest share of accidents and have decreased by about half from 1990 to 2004. Air taxis make up the second largest share of accidents and have decreased by more than half. Accidents involving commuter operations have been decreasing since 1999. Commuter, air taxi and part 135 flying as 91 accidents were at their lowest levels in 2003 and 2004

Table 4 Accidents in Alaska by FAR Part, 1990 to 2004

	FAR part 91	135 as 91	FAR part 135		Public	FAR part 121		133	125	129	137	Total
			Airtaxis	Commuters		Nonsched	Sched					
1990	140	7	35	5	3	0	1	3	0	0	0	194
1991	117	7	25	10	6	0	0	4	0	0	0	169
1992	125	9	25	12	11	0	0	4	2	0	0	190
1993	117	19	26	6	6	0	0	3	1	2	0	183
1994	86	11	32	2	2	1	1	0	0	0	0	135
1995	118	15	22	7	9	1	0	2	0	0	0	174
1996	102	11	30	4	6	2	3	1	0	0	0	159
1997	97	11	28	11	7	0	1	1	0	1	0	158
1998	111	9	30	8	7	1	1	0	1	2	1	175
1999	99	11	26	12	4	3	1	1	0	0	0	157
2000	84	16	18	10	4	0	2	0	2	0	0	138
2001	81	11	18	5	9	3	0	1	1	0	0	130
2002	84	14	27	7	5	1	2	0	0	1	0	142
2003	83	8	20	1	3	0	2	1	0	0	0	118
2004	73	7	15	4	1	1	0	1	0	0	0	102

Source: NTSB Accident and Incident Database (2005) (ftp:///www.ntsb.gov/avdata/avall.mdb 6/1/05 version)

Table 5 shows fatal accidents in Alaska by FAR part number. More fatal accidents occur with FAR part 91 operations than any other type. Commuter operations have not been involved in any fatal accidents since 2001. There have been no fatal accidents involving FAR part 135 flying as 91 since 2000. There is no clear trend in fatal accidents involving air taxi operations.

Table 5 Fatal Accidents in Alaska by FAR Part, 1990 to 2004.

	91	135 flying as 91	135		Public	121		133	125	129	137	Total
			Airtaxis	Commuters		Nonsched	Sched					
1990	17	1	5	2	0	0	0	0	0	0	0	25
1991	11	3	2	2	0	0	0	1	0	0	0	19
1992	11	1	3	1	1	0	0	1	0	0	0	18
1993	16	2	1	1	0	0	0	2	0	1	0	23
1994	8	0	7	1	0	0	0	0	0	0	0	16
1995	15	1	3	1	0	0	0	0	0	0	0	20
1996	12	1	7	0	0	1	0	1	0	0	0	22
1997	10	3	6	3	0	0	0	0	0	0	0	22
1998	7	1	4	0	3	0	0	0	0	0	0	15
1999	8	0	1	4	1	0	0	0	0	0	0	14
2000	7	2	3	1	0	0	0	0	1	0	0	14
2001	3	0	4	1	1	0	0	0	0	0	0	9
2002	9	0	4	0	1	0	0	0	0	0	0	14
2003	6	0	4	0	0	0	0	0	0	0	0	10
2004	9	0	3	0	0	0	0	0	0	0	0	12

Source: NTSB Accident and Incident Database (2005) (ftp:///www.ntsb.gov/avdata/avall.mdb 6/1/05 version)

Table 6 presents commuter and air taxi accidents by type of flight plan filed. The table shows that few accidents are on flights filing IFR flight plans. Accidents on flights with VFR flight plans make up the largest portion of accidents. Fatal accidents are also lower on flights with IFR flight plans. Since 1990, only three fatal accidents involving air taxis, commuters or FAR part 135 flying as 91 were on flights with IFR flight plans (Table 7). Fifteen fatal accidents involved FAR part 135 flying as 91, 13 of these were on flights with VFR flight plans, the remaining two were on flights with no flight plan filed.

Table 6 Air Taxi and Commuter Accidents by Type of Flight Plan Filed, 1990-2004.

	Air Taxis				Commuters				FAR 135 flying as 91			
	IFR Flight Plan Flied	VFR Flight Plan Filed	No Flight Plan Filed	Total Accidents	IFR Flight Plan Flied	VFR Flight Plan Filed	No Flight Plan Filed	Total Accidents	IFR Flight Plan Flied	VFR Flight Plan Filed	No Flight Plan Filed	Total Accidents
1990	1	30	4	35	0	4	1	5	0	5	2	7
1991	0	25	0	25	2	8	0	10	0	5	2	7
1992	0	24	1	25	2	10	0	12	0	7	2	9
1993	0	22	4	26	1	5	0	6	2	16	1	19
1994	0	31	1	32	0	2	0	2	1	9	1	11
1995	0	21	1	22	0	7	0	7	0	11	4	15
1996	0	30	0	30	1	3	0	4	0	9	2	11
1997	1	27	0	28	0	10	0	10	0	9	2	11
1998	2	28	0	30	0	8	0	8	2	5	1	9
1999	1	25	0	26	0	12	0	12	1	9	1	11
2000	0	17	1	18	2	8	0	10	0	13	3	16
2001	1	16	1	18	0	4	0	4	0	11	0	11
2002	0	26	1	27	0	7	0	7	1	10	3	14
2003	2	18	0	20	0	1	0	1	1	7	0	8
2004	2	12	1	15	0	4	0	4	0	7	0	7

Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version)

Table 7 Air Taxi and Commuter Fatal Accidents by Type of Flight Plan Filed, 1990-2004

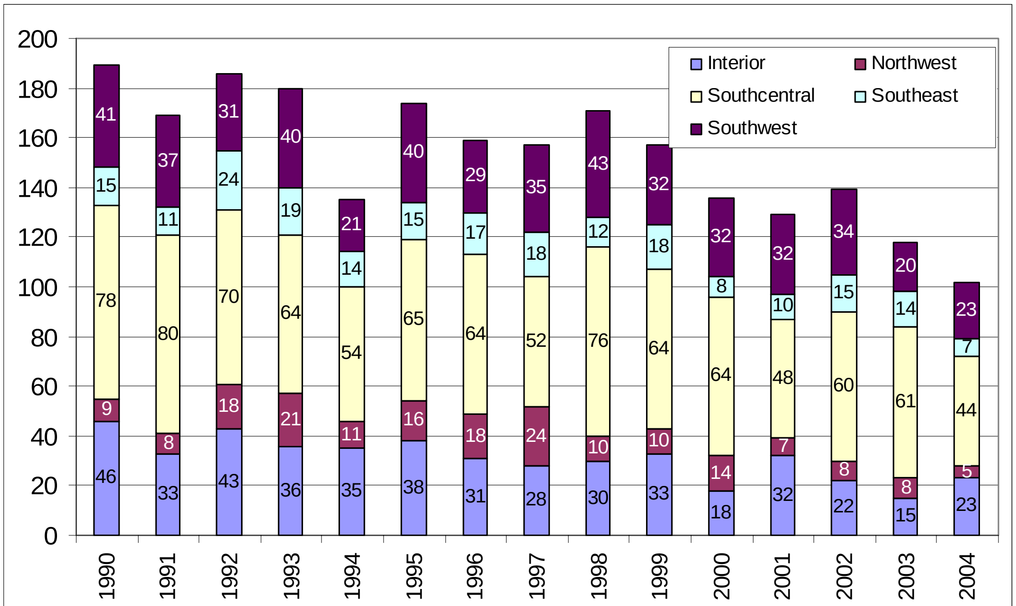
	Air taxis				Commuters			
	IFR Flight Plan Filed	VFR Flight Plan Filed	No Flight Plan Filed	Total Fatal Accidents	IFR Flight Plan Filed	VFR Flight Plan Filed	No Flight Plan Filed	Total Fatal Accidents
1990	0	5	2	7	0	2	1	3
1991	0	2	0	2	1	2	0	3
1992	0	3	0	3	0	1	0	1
1993	0	1	1	2	0	1	0	1
1994	0	7	0	7	0	1	0	1
1995	0	3	0	3	0	1	0	1
1996	0	7	0	7	0	0	0	0
1997	1	6	0	7	0	3	0	3
1998	0	4	0	4	0	0	0	0
1999	0	1	0	1	0	4	0	4
2000	0	3	1	4	0	1	0	1
2001	0	4	1	5	0	1	0	1
2002	0	4	1	5	0	0	0	0
2003	0	4	0	4	0	0	0	0
2004	1	3	0	4	0	0	0	0

Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version)

Accidents by Region

Historically, more accidents involving commuters, air taxis and FAR part 135 flying as 91 have occurred in south central and southwest Alaska than in other areas of the state. Since 1990, there have been 201 accidents in southwest and 174 accidents in south central. Figure 9 shows that accidents have decreased in both regions.

Figure 9 Accidents Involving Commuters, Air Taxis and FAR Part 135 Flying as 91 by Region of Alaska, 1990-2004



Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version).

Table 8 shows the same accident data by both region and the FAR part (commuter, air taxi, or 135 flying as 91). In all regions, air taxi accidents make up the largest share of accidents involving FAR 135 operations, followed by FAR part 135 flying as 91. Historically, there have been more commuter and air taxi accidents in southwest Alaska than in any other region. In south central and southwest Alaska, accidents involving air taxis have decreased since 1990. Trends are not evident in other regions because of the small number of accidents.

Table 8 Accidents Involving Commuters, Air Taxis and FAR Part 135 Flying as 91 by Region of Alaska, 1990-2004

	Interior				North				South central			
	Air taxis	Commuters	135 as 91	Total	Air taxis	Commuters	135 as 91	Total	Air taxis	Commuters	135 as 91	Total
1990	4	0	0	4	3	1	1	5	9	1	4	14
1991	3	1	0	4	2	2	0	4	8	3	4	15
1992	5	0	1	6	2	3	2	7	5	1	2	8
1993	3	0	4	7	2	4	6	12	10	0	3	13
1994	5	0	2	7	3	1	1	5	13	0	4	17
1995	4	0	1	5	3	2	0	5	6	0	7	13
1996	6	0	1	7	2	3	2	7	7	0	5	12
1997	4	1	1	6	4	7	2	13	6	0	3	9
1998	6	0	1	7	2	3	1	6	7	1	5	13
1999	5	2	1	8	1	2	1	4	7	1	4	12
2000	3	1	1	5	2	5	2	9	4	1	7	12
2001	2	0	1	3	1	0	1	2	5	0	3	8
2002	4	3	3	10	3	1	1	5	8	0	6	14
2003	3	0	1	4	4	1	1	6	6	0	2	8
2004	3	1	0	4	3	0	0	3	5	0	1	6
	60	9	18	87	37	35	21	93	106	8	60	174

	Southeast				Southwest			
	Air taxis	Commuters	135 as 91	Total	Air taxis	Commuters	135 as 91	Total
1990	7	0	1	8	10	3	1	14
1991	2	1	2	5	10	3	1	14
1992	5	2	2	9	7	6	2	15
1993	3	0	2	5	8	2	4	14
1994	5	0	3	8	6	1	1	8
1995	4	2	1	7	5	3	6	14
1996	4	0	3	7	11	0	0	11
1997	2	0	2	4	12	3	3	18
1998	1	1	0	2	14	3	1	18
1999	5	0	2	7	8	7	3	18
2000	1	0	2	3	8	3	4	15
2001	3	0	2	5	7	5	4	16
2002	6	2	0	8	6	1	4	11
2003	4	0	1	5	3	0	3	6
2004	3	0	1	4	1	3	5	9
29955	55	8	24	87	116	43	42	201

Source: NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version)

Near Mid-Air Collisions

The FAA maintains the Near Midair Collision System (NMACS) database[18]. A near mid-air incident is when two aircraft passing within 500 feet of each other. Pilots or flight crew may file reports. Reporting is voluntary. Table 9 summarizes NMACS data from 1998 through 2004 by operations type. The type of air operations was known in only 37 (63 percent) of the 59 reported incidents during this period. Of these incidents, 42 percent involved military aircraft. Because near mid air collisions are reported voluntarily and there are so few observations not involving military aircraft, we do not consider them further in the analysis.

Table 9 Near Midair Collisions in Alaska by FAR Part 1998-2004

	Air taxi	Commuter	Foreign carrier	General aviation	Public	US Carrier	Military	Unknown	Total
Air taxi	2	2	0	0	0	3	2	4	13
Commuter		2	0	1	1	0	0	1	5
Foreign carrier			0	2	0	0	1	1	4
General aviation				4	0	2	10	5	21
Public					0	0	0	1	1
US Carrier						2	1	5	8
Military							2	3	5
Unknown								2	2
Total	2	4	0	7	1	7	16	22	59

Source: FAA Near Midair Collision System (NMACS) (2005) https://www.nasdac.faa.gov (accessed 5/30/05).

Overall, the accident data from the NTSB show a significant decline in the number of accidents and the number of fatal accidents over the past five to ten years. The decrease in the number of accidents, while a positive indicator by itself, only represents safer flying conditions if the number of accidents has decreased relative to operations levels; that is, if accident rates have decreased. In order to evaluate the contribution of the interagency initiative on the decline in risk, we also require estimates of operations changes for the different sectors of the industry covered by different initiative components. The next section discusses estimates of changes in operations levels, which enable us to turn the number of accidents into accident rates.

[18] https://www.nasdac.faa.gov/

5. Changes in Operations Levels

In order to assess the risk of flying in Alaska, we need to turn data on the number of accidents into estimates of accident rates. An accident rate is a fraction obtained by dividing the number of accidents for a particular sector of the industry by the level of operations. This is not as simple a calculation as it might seem, because no comprehensive source of data on Alaska air operations – the denominator of the fraction – exists. To estimate accident rates, we have to estimate the level of operations. To make our estimates of how much flying is occurring in Alaska, we draw on several sources of data:

- Airport managers' estimates of the number of arrivals and departures, compiled by the FAA's Office of Aviation Policy and Plans (APO) (1997–2003);
- Counts of arrivals and departures from air traffic control towers (1997–2004);
- Reports filed with the Bureau of Transportation Statistics by air carrier companies who are members of the Regional Airline Association.[19] Passenger counts are available for both commuter and air taxi service. For commuter service only, departures, aircraft hours, and several other measures are also available (Q1 1977-Q2 2002).
- Bypass mail volume on mainline operations (i.e. out of Anchorage and Fairbanks). (1997–2004);
- General Aviation and Air Taxi Activity (GAATA) survey (1997-2003). Statewide estimates of hours flown by type of flying (personal, corporate, instruction, air taxi, touring, aerial spraying and observation) and type of flight plan (IFR, VFR, no flight plan).

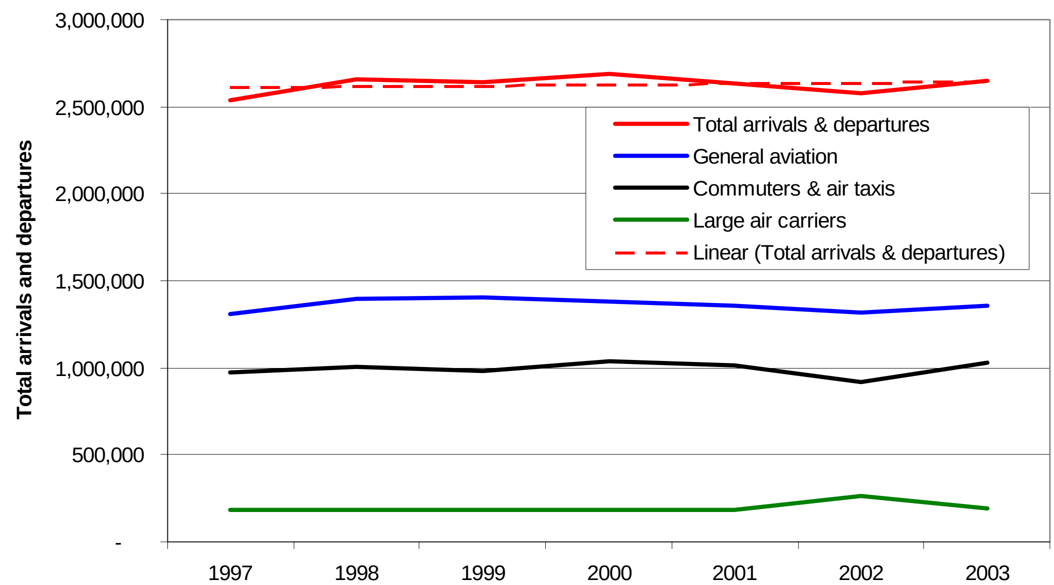
[19] While this group does not include most of Alaska's smallest (1- and 2-pilot) air operators, it does include the larger companies such as ERA, PenAir, and Hageland that make up the majority of Alaska part 135 flying.

FAA Office of Aviation Policy and Plans (APO) Terminal Area Forecast (TAF)

Figure 10 shows FAA APO estimates of total arrivals and departures for all official airports in Alaska. In these estimates, total arrivals and departures for all FAR parts have been essentially flat since 1997.

Airport managers' estimates are the only data available that cover all FAR parts at all of Alaska's public airports. However, these estimates are not necessarily accurate. Airport managers for many small airports have no staff, no formalized way of counting operations by type, and are present at the airport only part of the time. Many base their estimate on the previous year's estimate–for 65 percent of airports reporting, total operations did not vary at all over the seven years reported here.

Figure 10 Estimated Total Arrivals and Departures at Alaska's Public Airports 1997-2003

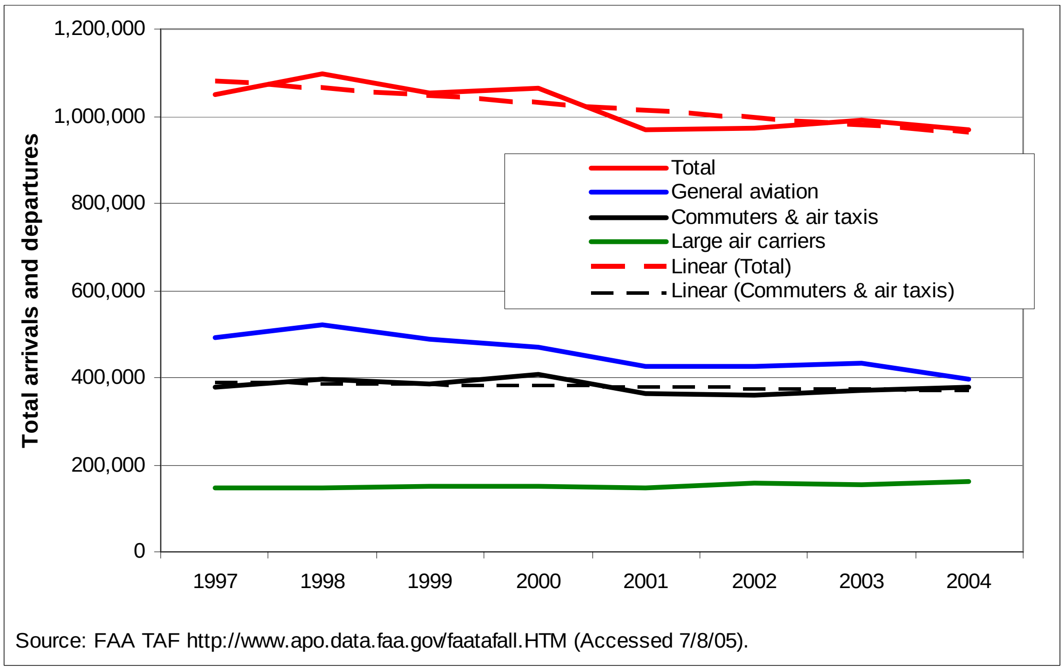


Source: FAA TAF http://www.apo.data.faa.gov/faatafall.HTM (Accessed 7/8/05).

FAA Office of Aviation Policy and Plans (APO) Air Traffic Activity Data System (ATADS)

The Air Traffic Activity Data System (ATADS) provides counts of arrivals and departures at airports with control towers. Figure 11 shows counts of arrivals and departures at eight airports.[20] These eight airports include the five busiest in the state and together account for over half of total air operations (based on the airport managers' estimates, above). These counts should be more reliable estimates of operations than those of airport managers; since trained personnel, whose job it is to monitor traffic, make them. The tower counts show a decline in total arrivals and departures, primarily driven by a decline in general aviation operations.

Figure 11 Arrivals and Departures at Eight Alaska Air Traffic Control Towers, 1997 to 2004

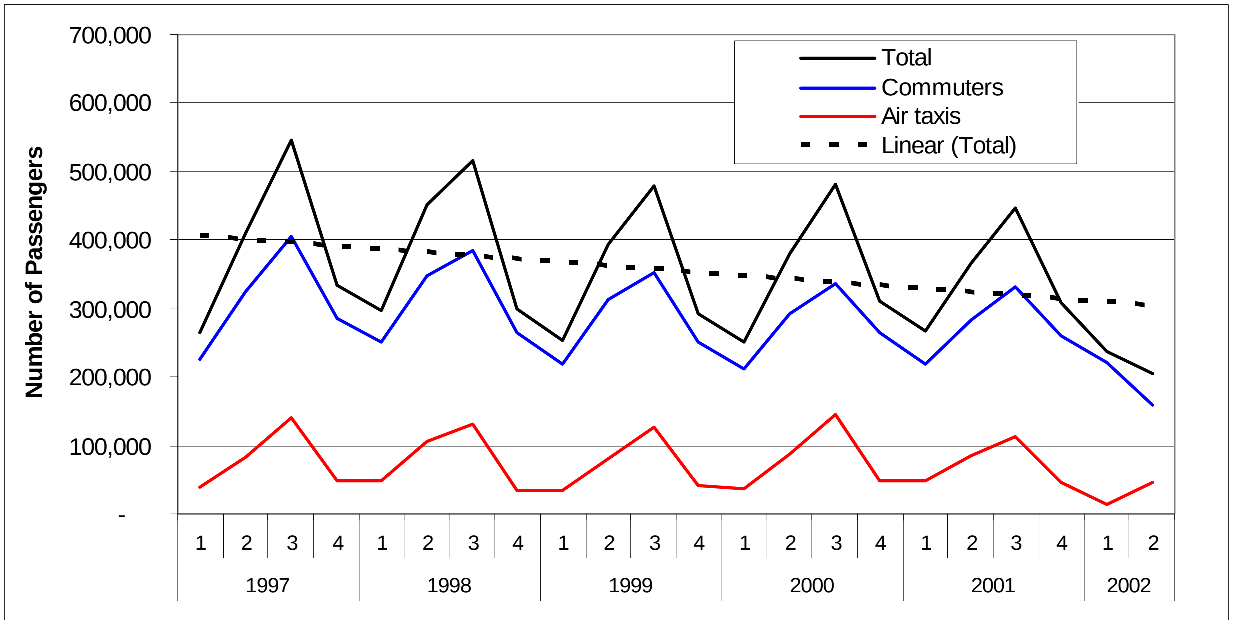


[20] Ted Stevens International, Merrill Field, Fairbanks International, Juneau, Kenai, Kodiak, King Salmon and Bethel

Bureau of Transportation Statistics (BTS) Passenger Counts

Reporting requirements for commuters and air taxis are contained in FAR Title 14 part 298. Commuters are required to report activity to the Bureau of Transportation Statistics (BTS) using Form 298-C schedules A-1 and T-1. Air taxis report on schedule E-1. Full descriptions of the data collected are available on the BTS website (http://itdb.bts.gov/). Figure 12 shows passenger counts of commuter and air taxi operations by quarter, beginning with the first quarter of 1997 through the second quarter of 2002. The seasonality of these small operations is evident. The number of commuter passengers has been declining faster (about 3 percent per year) than the number of air taxi passengers (about 1 percent per year). Compared to previous years, commuter and air taxi passenger totals were lower in third quarter 2001 and first two quarters of 2002. We attribute this change to 9/11.

Figure 12 Commuter and Air Taxi Passengers in Alaska, Quarterly 1997-2002

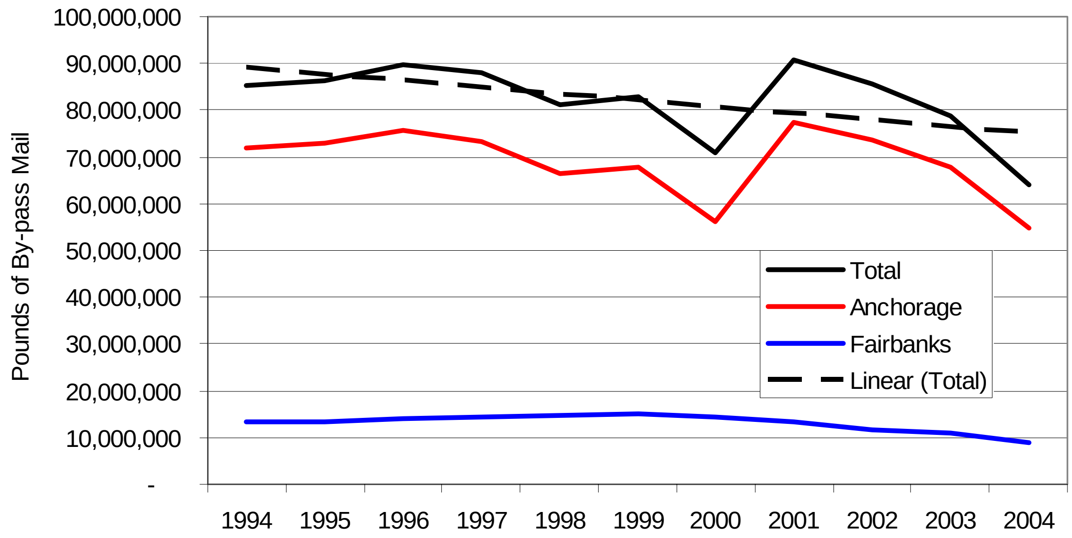


Source: BTS Intermodal Transportation Database http://www.transtats.bts.gov/tables.asp 298e1/t1 zip files downloaded 6/10/05

United States Postal Service (USPS) Data: By-Pass Mail Volume

Figure 13 shows the pound of by-pass mail shipped from Fairbanks and Anchorage from 1994 through 2004. This indicator also declines, much more sharply in Fairbanks than in Anchorage. From 1997 though 2003, the volume of bypass mail from Alaska's two main line hubs decreased at about 1.3 percent per year. We do not have an explanation for the drop in 2000, and consider it to more likely be a statistical artifact than an actual decrease.

Figure 13 Main Line By-Pass Mail Volume, 1994 to 2004

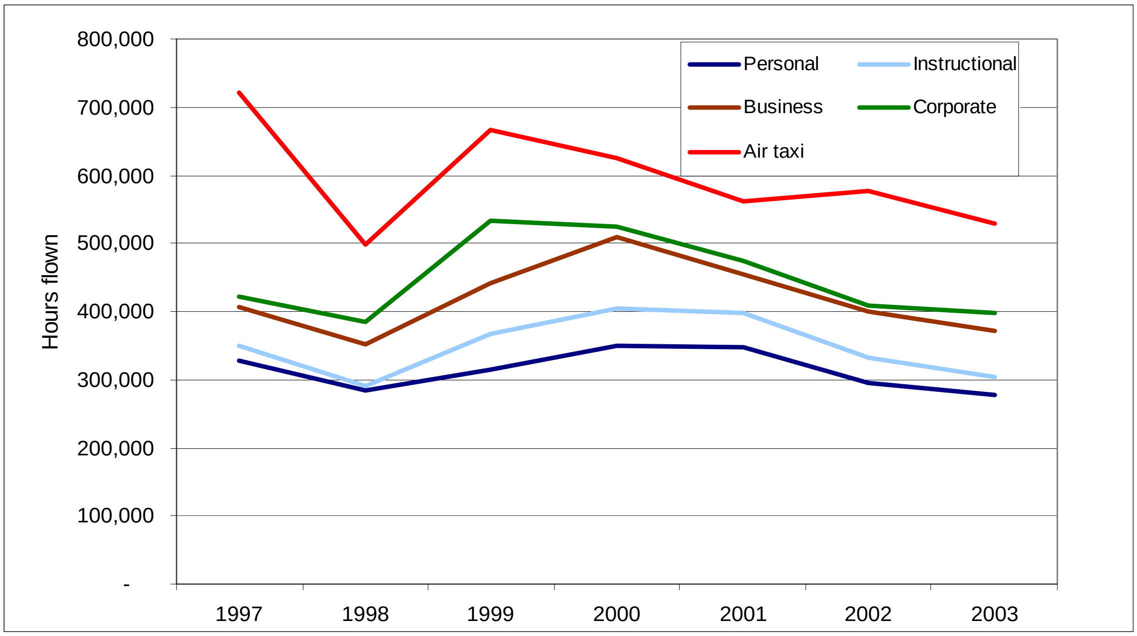


Source: USPS; Debbie Castignetti, 266-

FAA Data: General Aviation and Air Taxi Survey (GAATA)

Data on air taxi operations come from the General Aviation and Air Taxi survey (GAATA). GAATA data presented in Figure 14 show a decrease of 7.5 percent per year in hours flown since 1999 for all types of flying. Personal flying makes up the largest share of hours. Air taxi hours increased slightly in 2002, following a drop after 9/11 but overall have been decreasing since 1999. The changes from 1997 to 1998 are due to methodological changes in survey sampling and weighting.

Figure 14 Changes in General Aviation and Air Taxi Hours, 1997-2003



Source: GAATA and ISER analysis

Operations Data Summary

Table 10 summarizes the operations data we use in the rate estimates. Data from several sources indicate that aviations operations have been decreasing. The table shows an additional data disparity that makes us further question the reliability of the TAF estimates: in some years, departures estimates from the TAF for commuters and air taxis combined are lower than operators' reports of commuter departures. When we calculate accident rates in the next section of the report, we rely on multiple data sources because of inaccuracies, changes in data collection methodologies and irregularities in the data.

Table 10 Commuter and Air Taxi Operations in Alaska, 1997-2003

	Hours		Passengers		Departures[1a]	Departures[2b]
	Commuters[2b]	Air taxis[3]	Commuters[4c]	Air taxis[5c]	Commuters & air taxis	Commuters
1997	359,653	299,017	1,240,467	313,038	486,877	565,266
1998	353,503	115,586	1,240,098	322,424	501,365	558,135
1999	329,244	133,207	1,132,861	284,915	491,580	488,087
2000	303,058	100,278	1,103,516	311,190	520,573	451,253
2001	282,493	88,384	1,092,875	292,188	507,784	433,757
2002	103,819	166,287	1,092,875	292,188	459,017	148,503
2003					514,788	

Sources:

1. TAF (2005) http://www.apo.data.faa.gov/faatafall.HTM
2. BTS, 298C_A1, http://www.transtats.bts.gov/ (zip files downloaded 6/5/05).
3. FAA (1997-2003) GAATA survey
4. BTS, 298C_T1, http://www.transtats.bts.gov/ (zip files downloaded 6/10/05).
5. BTS, 298C_E1, http://www.transtats.bts.gov/ (zip files downloaded 6/5/05).

Notes:

a. Departures equal arrivals and departures divided by 2.

b. Data cover 1997 through the second quarter of 2002.

c. Passenger counts estimated for 2002

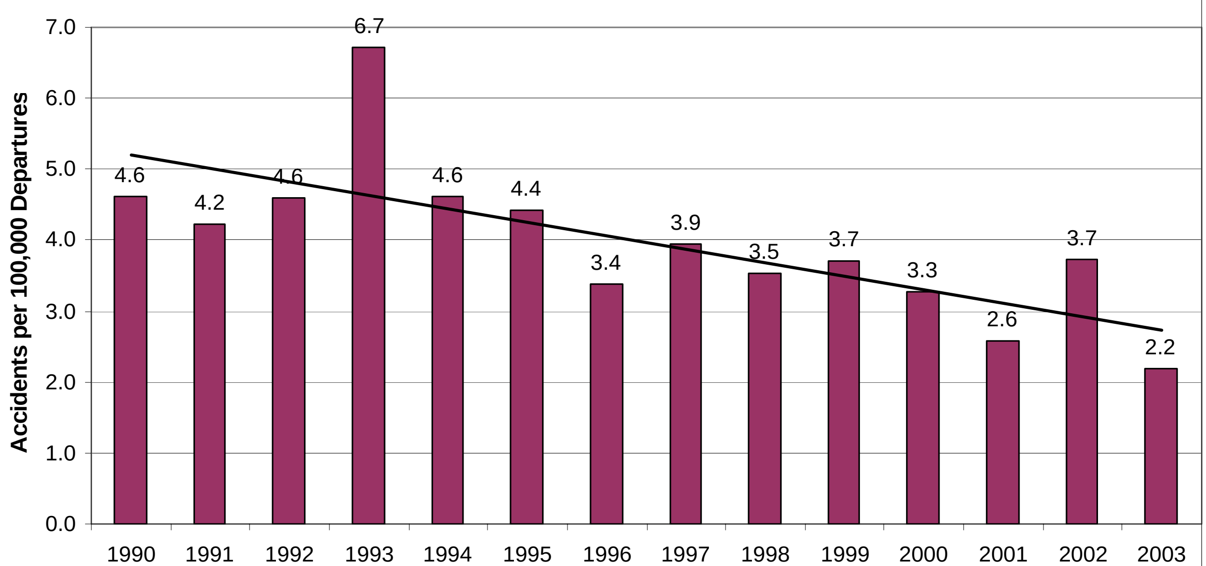
6. Accident Rates and Fatal Accident Rates

This section combines operations and accident data to estimate accident rates and fatal accident rates for commuter and air taxi operations. In order to say that flying has become safer, accident *rates*, not the number of accidents, need to decline over time. Because we do not yet have operations (denominator) data for 2004, we cannot compute rates past 2003. Consequently, accident rates do not include the sharp drop in the number of accidents in 2003 and 2004.

The discussion in this section begins at the statewide level, looking at changes in accident rates over time, then separates out commuters and air taxis and examines regional patterns. Denominator data on operations vary in coverage and reliability. We use data from several sources to piece together a picture of accident rates over time and across the state. We grouped numerator data (accidents) so that the coverage was the same as the denominators.

Over the 14 years from 1990 to 2003, aviation accident rates in Alaska have been decreasing. Statewide accident rates shown in Figure 15 use the TAF estimates of departures as the denominator. The figure shows that accident rates peaked in 1993 but have been decreasing since.

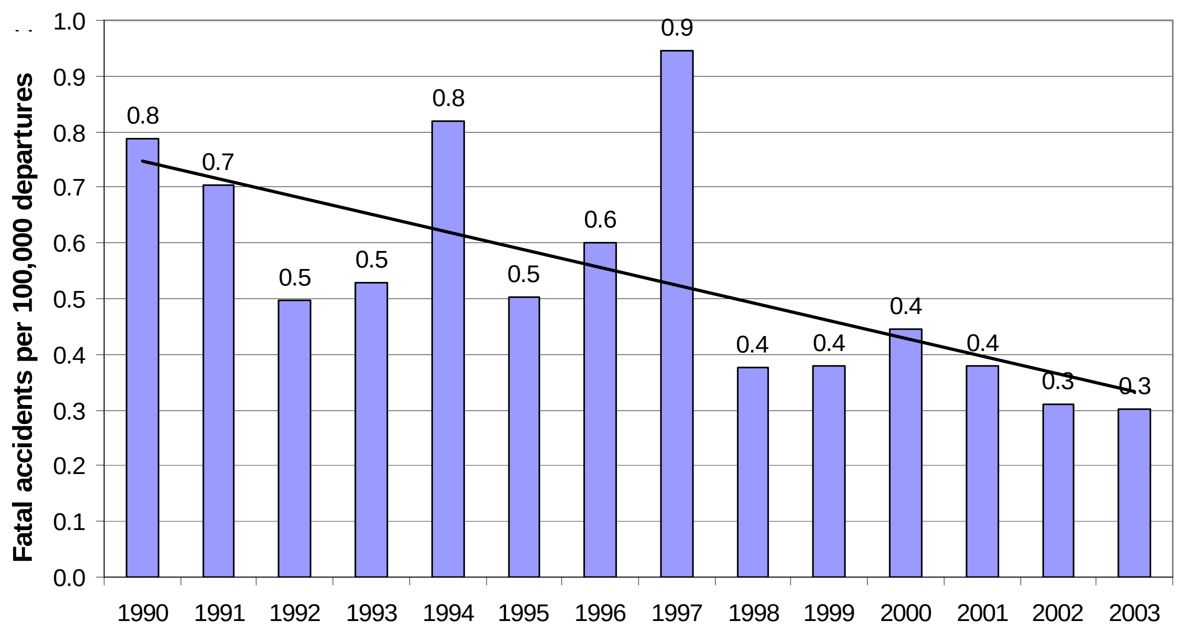
Figure 15 Alaska Accidents per 100,000 Departures for All FAR Parts, 1990-2004



Sources: TAF (2005) www.apo.data.faa.gov/faatafall.htm
NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version).

Figure 16 also uses the TAF data, and shows that fatal accident rates peaked in 1997, but have been decreasing since. The overall trend over the 14 years is decreasing fatal accident rates.

Figure 16 Alaska Fatal Accidents per 100,000 Departures, 1990-2003.



Sources: TAF (2005) www.apo.data.faa.gov/faatafall.htm
NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/avall.mdb 6/1/05 version).

In Table 11 we show accident rates using operations data from several sources, looking for robust evidence of a trend or pattern. Data in the first four columns compare commuter and air taxis accident rates. The first two columns use hours flown as a denominator. The second two columns use passengers as denominators. Both sets of columns show that accident rates are higher for air taxis than commuters. None of the six columns in the table show a trend in accident rates over time. Columns one and five show accident rates for 2003. Column one shows that air taxi accident rates (calculated as accidents per 100,000 hours) dropped from 2002 to 2003. Column five shows that rates for commuters and air taxis combined (calculated as accidents per 100,000 departures) also dropped between 2002 and 2003. This may be an indication of program effectiveness.

Table 11 Alaska Commuter and Air Taxi Accident Rates, 1997-2003[a]

	Accidents per 100,000 hours		Accidents per 100,000 passengers flown[b]		Accidents per 100,000 departures (TAF)[5c]	100,000 departures (298c_A1)[2]
	Air taxis[1]	Commuters[2d]	Air taxis[3d]	Commuters[4]	Air taxis & Commuters	Commuters
1997	9.4	3.1	4.5	0.9	10.3	1.9
1998	26.0	2.3	3.7	0.6	9.4	1.4
1999	19.5	3.6	3.5	1.1	10.0	2.5
2000	18.0	3.3	3.5	0.9	8.5	2.2
2001	20.4	1.8	3.1	0.5	6.7	1.2
2002	16.2	2.9	5.1	0.3	10.5	2.0
2003	15.3				5.6	

Sources:

1. GAATA Survey 1997, 1998, 1999, 2000, 2001, 2002, 2003
2. BTS, 298C_A1, http://www.transtats.bts.gov/ (zip files downloaded 6/5/05).
3. BTS, 298C_E1, http://www.transtats.bts.gov/ (zip files downloaded 6/5/05).
4. BTS, 298C_T1, http://www.transtats.bts.gov/ (zip files downloaded 6/10/05).
5. Terminal Area Forecast, http://www.apo.data.faa.gov/faatafall.HTM

Notes:

a. BTS data cover 1997 through the second quarter of 2002. Accidents numerators also cover only the first two quarters of 2002.
b. Passenger data estimated for third and fourth quarters 2002 using carrier level 298c data for earlier quarters and years.
c. Rates include FAR part 135 flying as 91.
d. Numerator includes only accidents of carriers whose hours are included in the denominator.

Table 12 shows fatal accident rates, again using multiple measures of operations as denominators. Looking at the first four columns, with the exception of 1999, fatal accident rates are higher for air taxis than commuters. There is no clear trend in fatal accident rates involving air taxis. There have been no fatal accidents involving commuters since 2001.

Table 12 Alaska Fatal Accident Rates for Commuters and Air Taxis, 1997-2004

	Fatal accidents per 100,000 hours		Fatal accidents per 100,000 passengers		Fatal accidents per 100,000 departures[5c]	Fatal accidents per 100,000 departures[2]
	Air taxis[1]	Commuters[2]	Air taxis[3a,d]	Commuters[4]	Air taxis & Commuters	Commuters
1997	2.0	0.8	1.3	0.2	2.5	0.5
1998	3.5	0.0	0.6	0.0	1.0	0.0
1999	0.8	1.2	0.0	0.4	1.0	0.8
2000	3.0	0.3	0.3	0.1	1.2	0.2
2001	4.5	0.4	1.0	0.1	1.0	0.2
2002 [b]	2.4	0.0	0.7	0.0	0.9	0.0
2003 [b]	3.1	0.0		0.0	0.8	0.0
2004 [b]		0.0		0.0		0.0

Sources:

1. GAATA Survey 1997, 1998, 1999, 2000, 2001, 2002, 2003
2. BTS, 298C_A1, http://www.transtats.bts.gov/ (zip files downloaded 6/5/05).
3. BTS, 298C_E1, http://www.transtats.bts.gov/ (zip files downloaded 6/5/05).
4. BTS, 298C_T1, http://www.transtats.bts.gov/ (zip files downloaded 6/10/05).
5. Terminal Area Forecast, http://www.apo.data.faa.gov/faatafall.HTM

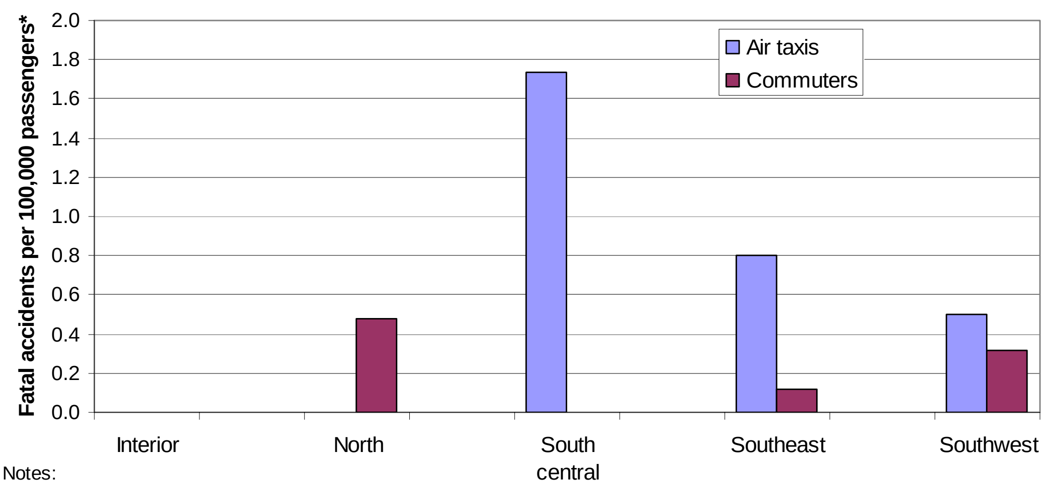
Notes:

a. Passenger data estimated for third and fourth quarters 2002 using carrier level 298c data for earlier quarters and years.
b. There were no fatal accidents involving commuter aircraft in 2002, 2003 or 2004.
c. Rates include FAR part 135 flying as 91.
d. Numerator includes only accidents of carriers included in denominator hours.

We grouped accident and passenger data by region to analyze whether flying some regions of the state is more dangerous than others. From the accident data, we used latitude and longitude of the accident site to assign regions[21]. Passenger data were assigned to regions based on the city where the flight originated.

Figure 17 shows estimated commuter and air taxi accident rates (measured as accidents per 100,000 passengers from 1997 through 2002). The figure shows average regional accident rates over a six year period. We used average rates because of the small number of accidents and large random variation from year to year in each region. We cannot use average accident rates over a long period of time to determine whether flying in southwest Capstone region has become safer since 2001 or whether flying in southeast Capstone region has become safer since 2003. Figure 17 shows that average air taxi rates are higher than commuter rates in all regions. Air taxi accident rates are highest in southwest Alaska, while commuter accident rates are highest in the north and southwest regions.

Figure 17 Commuter and Air Taxi Accidents per 100,000 Passengers by Region, 1997-2002

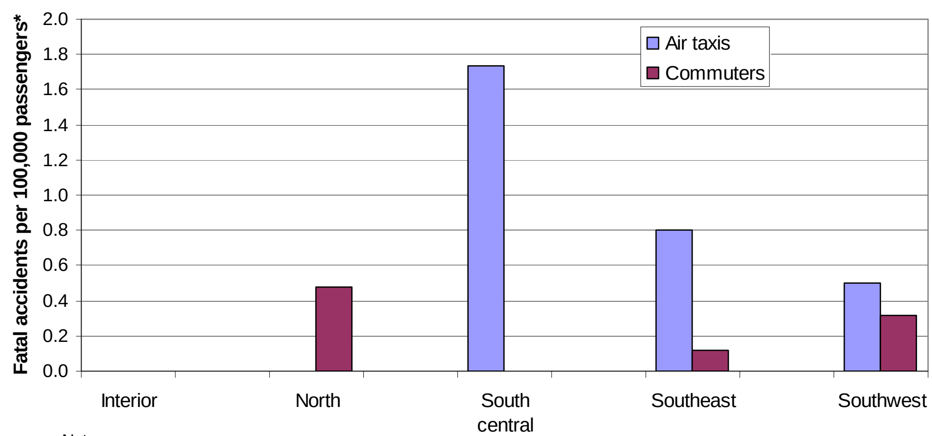


Notes:
*Accidents include only those of carriers who reported passengers to BTS.
Sources:
1. Commuter passenger data come from BTS, 298C_T1, http://www.transtats.bts.gov/ (accessed 06/26/05).
2. Air taxi passenger data come from BTS, 298C_E1, http://www.transtats.bts.gov/ (accessed 06/26/05).

[21] We checked the latitude and longitude variables, corrected errors and missing data.

Figure 18 shows that there were no fatal accidents in the interior region from 1997 through 2002. Air taxi fatal accident rates are generally higher than commuter fatal accident rates, and air taxi fatal accident rates are highest in south central Alaska.

Figure 18 Commuter and Air Taxi Fatal Accidents per 100,000 Passengers by Region, 1997-2002

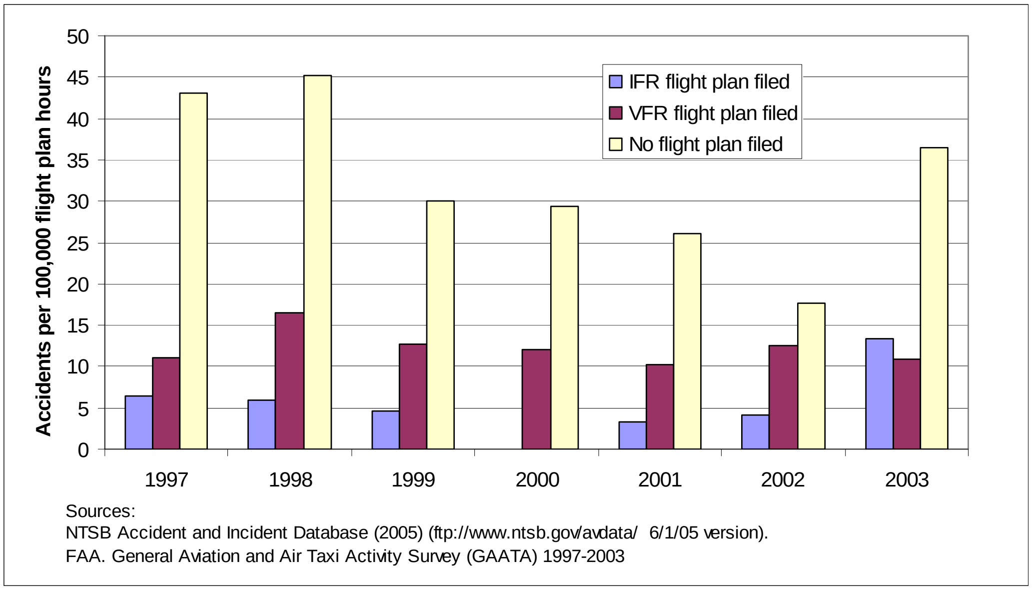


Notes:
*Accidents include only those of carriers who reported passengers to BTS.
Sources:
1. Commuter passenger data come from BTS, 298C_T1, http://www.transtats.bts.gov/ (accessed 06/26/05).
2. Air taxi passenger data come from BTS, 298C_E1, http://www.transtats.bts.gov/ (accessed 06/26/05).

The accident rate differences between air taxis and commuters could be due to more IFR commuter flights, if IFR flying is safer than VFR. There are no data available to provide separate estimates of air taxi and commuter IFR flying. Data from NTSB and the GAATA survey give a general picture of general aviation and air taxis, comparing accidents for 100,000 flight hours with IFR, VFR and no flight plans. Figure 19 shows that IFR flying is safer. However, there are no data that allow us to test whether more commuter flights than air taxi flights are IFR and therefore it is IFR flying that makes commuter accident rates lower.

We consider relative accident rates among IFR, VFR and no flight plans to be more accurate than the changes in rates from year to year because GAATA data on hours flown by flight plan (denominators) vary greatly from year to year.

Figure 19 General Aviation and Air Taxi Accidents per 100,000 Hours by Flight Plan, 1997-2003



We also calculated fatal accident rates from 1997 through 2003 for general aviation and air taxis by type of flight plan. Table 13 shows that there is no difference between fatal accident rates for IFR and VFR flight plan hours. Both are 1.5 per 100,000 flight plan hours. Fatal accidents per no flight plan hours are 1.9 per 100,000.

Table 13 Fatal Accidents per 100,000 Hours by Type of Flight Plan Filed, 1997-2003

	Fatal accidents per 100,000 IFR flight plan hours	Fatal accidents per 100,000 VFR flight plan hours	Fatal accidents per 100,000 no flight plan hours
1997-2003	1.5	1.5	1.9

Sources:
NTSB Accident and Incident Database (2005) (ftp://www.ntsb.gov/avdata/ 6/1/05 version).
FAA. General Aviation and Air Taxi Activity Survey (GAATA) 1997-2003

Accident rates prior to 2001 (before any safety programs were fully implemented) show no clear trend toward safer flying. Rates from 2001 to 2003 show that by some measures, commuter and air taxi travel has become safer. This could indicate that programs are increasing commuter and air taxi safety statewide. However, the decrease does not show up in all rate measures. Commuter flying has been and continues to be safer than air taxi flying. There are regional differences in safety. Southwest Alaska has the highest air taxi accident rate and the second highest commuter accident rate in the state. In terms of fatal accidents, commuter flying, in every region of the state, has become safer statewide since 2001.

Commuter fatal accident rates are zero in all regions beginning in 2002. This coincides with implementation of the Capstone program. Capstone may have been a factor in the drop in fatal accidents in southwest Alaska, but other factors are responsible for the zero rates in the other regions. Medallion may be having an effect statewide.

To better understand what we learned in the analysis of accident rates, we used a Poisson equation to estimate the probability of an accident or fatal accident. A Poisson regression controls for year to year variation in accidents. In addition, we added Medallion program information to the equation. Note that this equation uses a subset of the accident data and includes only commuter operators who filed BTS 298C A1 forms. Commuter operators represented in the data accounted for about 68 percent (186 out of 284) of the total accidents and 60 percent (27 out of 45) total fatal accidents.

The results of the Poisson regression estimating accidents are presented in Table 14. The results show that for carriers included in this dataset, the measures for Medallion stars are important for safety. The second coefficient compares program participants with no stars to non-participants. It shows that operators participating in the program but have no stars, are no safer than non-participants. The third coefficient measures the effect of each additional star on the probability of an accident. It shows that the practices measured by Medallion are each associated with lower probability of an accident. The results also show that compared to south central Alaska, commuter flying in southwest Alaska is more dangerous. Air taxi travel is more dangerous than commuter flying. In this equation, using a subset of accident and passenger data, we cannot distinguish effects of the southwest Capstone program from other effects.

Table 14 Results of Poisson Regression Estimating Accidents

	Coefficient	Chisq	
Intercept	105.1847	3.060	*
Year (1990-2004)	-0.0559	3.470	*
Medallion participant with no stars	0.1315	0.530	
Number of Medallion stars	-0.1623	13.140	**
Capstone carrier flying in southwest Alaska after 2001 adjusted for implementation level	0.1859	0.190	
Southwest region	1.0044	5.730	**
Southeast region	-0.2688	0.240	
Interior region	0.0334	0.000	
Northern region	0.9885	5.190	**
Air taxi	1.0090	4.320	**
Air taxi flying in southwest region	-0.5721	1.200	
Air taxi flying in interior region	0.1136	0.030	
Air taxi flying in southeast region	-0.3197	0.230	
Air taxi flying in northern region	-1.2241	4.410	**
Ln(passengers)	-0.5087	123.510	**
Observations	1536		
-2 log likelihood	908.6014		

We also used a Poisson regression to estimate fatal accidents. There were no accidents involving air taxis in southeast and interior Alaska and so those regions were dropped from this equation. Table 15 shows that air taxi travel is more dangerous than commuter travel. There is no association between Medallion stars and fatal accidents. Fatal accidents involving southwest Capstone participants flying in southwest Alaska are no less likely than fatal accidents involving operators in other areas of the state. The time trend in fatal accidents supports the idea that the safety measures have cumulative effects.

Table 15 Results of Poisson Regression Estimating Fatal Accidents

	Fatal accidents		
	Coefficient		Chisq
Intercept	398.2296	**	5.43
Year (1990-2004)	-0.2034	**	5.66
Medallion participant with no stars	0.0580		0.02
Number of Medallion stars	-0.1242		1.34
Capstone carrier flying in southwest Alaska after 2001 adjusted for implementation level	0.2400		0.02
Southwest region	1.1325		1.47
Southeast region	0.0043		0
Interior region	-1.3994		1.56
Northern region	1.2917		1.81
Air taxi	1.8655	**	5.54
Air taxi flying in southwest region	-1.5880		2.41
Air taxi flying in northern region	-2.7105	**	3.96
Ln(passengers)	-0.5510	**	24.4
Observations	1536		
log likelihood	-113.2088		

To summarize the results:

- There is no clear trend in commuter and air taxi accident rates from 1997 through 2002. However, where data are available for 2003, they show that accident rates dropped between 2002 and 2003.
- Accident rates and fatal accident rates are higher for air taxi operations than for commuter operations.
- Air taxi accident rates are highest in southwest Alaska.
- Commuter accident rates are highest in north and southwest Alaska.
- Commuter fatal accident rates are zero for 2002-2004.
- There is no clear trend in fatal accidents involving air taxis.
- Medallion stars are associated with a lower probability of an accident.

Other analyses.

We analyzed a subset of accident and passenger data covering operators providing both commuter and air taxi service (and reporting passenger counts on BTS 298 forms) to learn more about why air taxi flying is more dangerous than commuter flying. We limited the analysis to operators with six or more accidents from 1997 through 2004. This covers ten operators and 124 out of 284 accidents involving commuters and air taxis. For these operators, air taxi accidents make up 47 percent of their total accidents even though air taxi service makes up 19 percent of their business (as measured by passengers).

By looking at commuter and air taxi accident rates for operators providing both kinds of service, we can say that it is probably not the case that air taxi operators are riskier. It is likely that higher air taxi accident rates are because air taxi operations are inherently more dangerous. Most air taxis fly to places and at times when there is no scheduled service. In Alaska, this means flying to and from glaciers, river sand bars, lakes and mountain tops

An additional finding from this analysis is that, for these operators, a disproportionate share of air taxi accidents are in regions where they do not normally fly. Twenty-two percent of their air taxi accidents were in regions where they do eight percent of their business. This fits with findings from other research. In a recent survey, Alaskan pilots said that showed that regional hazards training would be an effective way to prevent accidents (Conway, et al. 2004).

7. Conclusions

During the past 15 years, the total number of aviation accidents and the number of fatal accidents have both declined by nearly 50 percent. There have been no fatal accidents involving commuter aircraft since late 2001. In this study, we reviewed a number of factors that may have contributed to this outcome. Our analysis has produced the following general findings.

First, the Alaska aviation infrastructure is changing, and these changes may directly affect safety. Infrastructure providing weather observations has changed dramatically during the past 10 years. Manned flight service stations have been replaced by automated stations. The number of automated stations providing data is increasing, and web cameras now provide real-time information on weather and runway conditions at over 50 sites. Airport improvements and changes in technology allowing for precision GPS approaches have increased the number of rural airports that effectively offer IFR operations.

Second, the Alaska aviation industry is changing. Operations as a whole appear to be declining, but the decline is not uniform. Tower counts suggest that general aviation activity has declined, while other activity has stayed relatively constant. Regulations governing bypass mail deliveries changed in 2002 to favor larger companies that provide scheduled passenger service, and this appears to be associated with a decline in mail flights.

Third, some types of flying involve inherently more risks than others. Using a variety of methods to measure rates, we found that total accident rates and fatal accident rates are higher for air taxi operation than for commuter operations. Air taxi total accident rates exceed those of commuters in all Alaska regions. Fatal accident rates for air taxis are highest in Southcentral Alaska. This may partly be attributed to the high risks of mountain flying. Flying small planes in unfamiliar territory appears generally riskier than flying in familiar territory. Total accident rates are lower when flying under IFR flight plans than when flying under VFR flight plans. Accident rates when flying without filing a flight plan (all of which are presumably VFR flights) are higher still. Fatal accident rates are much higher for no-flight-plan flights as well.

In general, we found that accident rates as a whole have declined, but the decline in rates has not been as great as the decline in the total number of accidents. At least some, if not most, of this improvement in accident rates appears to be associated with the shifts in the type of operations mentioned above.

It is challenging to sort out whether the Alaska Interagency Aviation Safety Initiative has contributed to the observed reduction in accident rates, much less quantify the role of any one of its constituent programs. The initiative combines different programs that were all implemented during a short window of time since 2001. Only Capstone Phase I (Southwest Alaska) was fully implemented by the end of our study period, with just two complete years (2003 and 2004) of post-implementation data. The Medallion program held its first seminar in August of 2002, Mike-in-hand operated out of only one weather service office in 2001, and has been slowly growing since. Circle of Safety began in late 2002. If we are not able to link declining accident rates to individual programs, it does not necessarily imply that that program is ineffective. Rather, it may be simply too early to tell. Unless the effect of a program is very large, one typically needs data over many years to determine statistically whether the effect is significant.

Another complication with the evaluation is that the interagency initiative combines a set of programs with overlapping target populations. The Capstone program was intensively implemented in certain regions. Capstone operators are eligible to enter the Medallion program, and some have. Many operators participating in the Capstone program fly in other parts of the state. Circle of Safety targets passenger operations.

Given changing pattern of operations in the Alaska aviation industry and the different inherent risks of certain types of flying, multivariate statistical analyses that can take multiple overlapping factors simultaneously into account are most likely to uncover effects of individual safety factors, if they exist. The Poisson regression analysis is most promising for this task, because that model assumes a pattern of variation that fits the data on accidents. We were able to estimate a multivariate statistical model for a large portion of the industry– commuter operators that provide some non-scheduled air service–accounting for about two-thirds of all accidents. We interpret the results of the Poisson equations estimated in the previous section as follows.

For total accidents, we found:

- Commuter operations are safer (as discussed above) than air taxi operations;
- Flying in Northern and Southwest Alaska is riskier than in Interior, South central, or Southeast Alaska;
- The elevated risk of air taxi operations significantly greater in Northern Alaska than in other regions;
- Taking into account the type of flying and region of operations, larger carriers are generally safer than smaller ones;
- Taking into account the type of flying, region of operations, and size of the company, company practices associated with Medallion stars improve safety.
- The time trend in fatal accidents supports the idea that the safety measures have cumulative effects.

Since the Medallion program is still in its early stages, it is too soon to say if the program has caused companies to change practices to improve safety. Rather, we interpret the finding to say that the practices that the Medallion program recognizes are, as a whole, associated with safe flying. The program appears to be successfully signaling practices that are associated with safety.

For the equation for fatal accidents, we found generally similar effects, but with less statistical power. This is likely due to the smaller numbers and greater variability of fatal accidents. Because there have been no fatal commuter accidents since 2001, there is no way to distinguish effects of any interagency initiative programs from a downward trend.

It is also difficult to separate effects of the different programs, and program effects from those resulting from infrastructure changes. When multiple factors affect all operations statewide, we cannot determine how much of that change is attributable to each program or infrastructure change. There also may be combined effects of mixes of infrastructure and programs that are greater than the sum of the individual infrastructure and program effects. One successful program may raise awareness about safe operating practices, and thereby make other programs more likely to succeed. Indeed, the sum total of programs in the interagency initiative may have cumulative effects on creating a ‘culture of safety’ that make the combined initiative more successful than any of its parts.